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DEVELOPMENT OF CLASSIFICATION MATERIAL LEARNING DEVICES USING MULTIPLE INQUIRY LEARNING MODELS TO IMPROVE SCIENCE PROCESS SKILLS AND STUDENT ACCURACY

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Abstract:
Science as a product prioritizes mastery of knowledge and science as an attitude to focus on attitudes that grow during the process and after learning. But now most teachers are considered lacking in developing science process skills that are part of the science learning process. The low level of science process skills of students will lead to low scientific knowledge and attitudes that are expected to emerge during the process and after the learning process. This study will aim to improve science process skills for students by using learning tools using inquiry models. The development design used uses the Dick and Carey model. Data collected in the form of the performance of science process skills and scientific attitudes of students' accuracy. The research subjects were 73 people from various schools in Banjarmasin. The results of the study showed that the device was designed to influence the science process skills and the scientific attitude of students' accuracy.

Keywords: research and development, material learning device, inquiry learning, science process skills, student accuracy

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1. Introduction

Natural Science Learning (IPA) in schools is inseparable from the nature of science. Science as a product emphasizes more on how students master concepts, laws, theories and principles, while science as an attitude to focus on scientific attitudes is expected to grow during learning and after learning. But in reality, these three components are not fully contained in science learning at school. Based on the identification of the results of interviews with teachers in the Banjarmasin City Science MGMP that most teachers focus more on learning only on cognitive abilities (products) of students and do not introduce and develop science process skills that are part of the science learning process. This has an impact on the low science process skills of students in the learning process of science (Saida et al., 2012). The low level of science process skills of students causes the growth of character or scientific attitude that is expected to emerge after the learning process is also low (Af'idayani et al., 2018). One scientific attitude that is always expected to emerge and be embedded after science learning is an attitude of accuracy. Someone who has been trained in science process skills according to Ambarsari (2013) will have an honest and thorough personality.

The low science process skills show that the way science is taught in schools does not lead to teaching methods that are in accordance with standard science learning. According to science teaching standards and standards for professional development of science teachers, teachers must present science learning material through a process of research and investigation, namely "science as process" through science skills such as observing, concluding and conducting experiments (Devi, 2010).

The discrepancy between the application of the nature of science and science learning in schools raises problems in improving science process skills and scientific attitude of accuracy. To overcome this problem a learning device is needed with methods that are able to improve science process skills as well as scientific attitudes of accuracy. One of the supporting factors for the success of the learning process is when using learning tools with appropriate learning models according to the subject matter (Rahayu et al., 2018). According to Akbar (2011), the learning device is one of the important aspects of the success of educators in carrying out the teaching and learning process because it is a signpost in conducting teaching and learning activities in the classroom, and as an evaluation material for educators to know the achievement of competency standards that have been delivered. 2013 curriculum has prepared learning tools in the form of syllabus, teaching materials in the form of teacher books and student books, with the hope that there are similarities from all education units in Indonesia (Kemendikbud, 2014). Existing learning devices are general in meaning they have similarities even though the material/topic different, this is the reason why it is difficult for teachers to use/utilize in the learning process. Therefore, it is necessary to develop the device by using the right learning model.

Science learning will be more optimal if it uses a learning model that makes students as subjects or centers of learning and is directly involved both individuals or groups in the learning process, so that learning is more meaningful and makes students more active. One learning model that can be used to make the learning process more meaningful through science process skills is a guided inquiry model. Components of science process skills can be integrated into guided inquiry syntax. This model was chosen because of the successful application of the guided inquiry model to the science process skills of students that has been proven by Jumarni, et al (2014). In his study concluded that the use of guided inquiry models can improve students' science process skills in motion system material. Through the development of this learning device, it is expected to be able to help teachers in the learning process in the classroom and be able to improve science process skills and scientific attitudes (accuracy) of students. In addition to helping students adjust between curriculum and challenges faced.

2. Methods

2.1 Research Framework

This research is divided into two research activities, namely the development of a science learning model for junior high school and the application of a device model/field trial in teaching and learning activities. Device development activities use the Dick and Carey model, while the application of the device model during the trial uses a quasi-experimental research design, with the design of one group pretest-posttest design by Tuckman (1978).

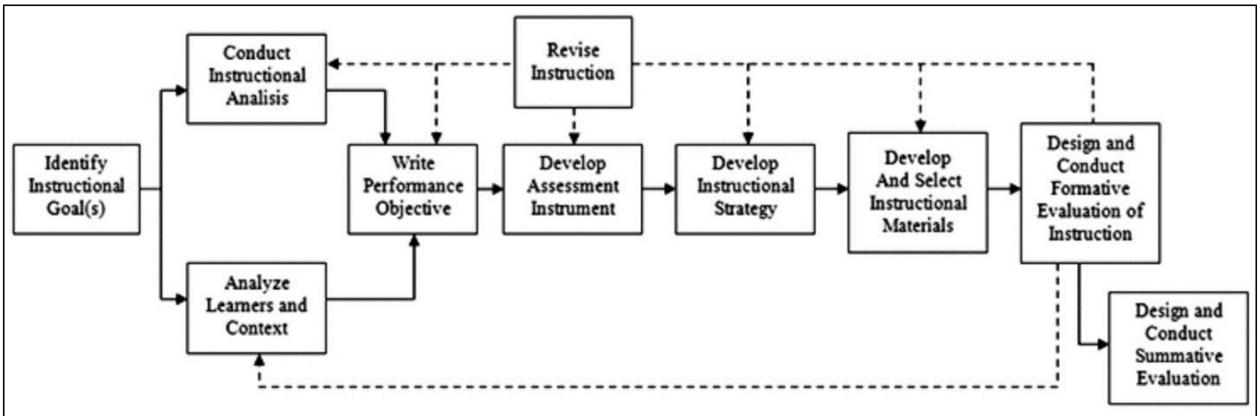

Figure 1: Dick & Carey Development Research Model

The trial was carried out on several junior high schools in Banjarmasin with a total of 73 students. The type of data used varies from primary data in the form of observations of the performance of science process skills, scientific attitude assessment accuracy sheets, and student responses.

3. Results and Discussion

3.1 Results of Basic Science Process Skills Analysis

Based on the results of the calculation of the answer score of the product assessment, the students used the t test, obtained data and presented in Tables 1 and 2.

Table 1: Results of a Large Class Basic Science Process Skill Analysis

Field Test	Session	Mean	t Stat	t Critical two-tail	Description
1	Pre test	28.641	3.368	2.006	Increases Significant
	Post test	40			
2	Pre test	32.291	5.214	1.998	Increases significant
	Post test	49.166			

Table 2: Results of Comparison of Basic Class 1 and 2 Basic Science Process Skills

Session	Mean	t Stat	t Critical two-tail	Description
SMP 23	49.166	2.367	2.002	Significantly different
SMP 29	40			

Based on the results of the analysis using the t test, for large class 1 obtained t-count 3.368 while t-table at the significance level of 5% is 2.006. In large class 2 obtained t-Critical two-tail 5.214, with the same significance level obtained value 1.998. From the data it is clearly seen a significant increase.

The basic science process skills of this study have different levels of difficulty. But indicators are selected and used by researchers in observations both directly and indirectly adjusted to the level of development of students. Rezba (1999) states that the instruments used must be adapted to the material, the level of development/grade level. Observing and measuring the focus on sensory ability, the ability to connect between what is seen, touched, smelled and felt by equating equations into data, is a discovery for students and this part of the knowledge they obtain themselves. This reinforces Piaget's opinion (Dahar, 2011) that students at the age of 11 are able to understand the surrounding environment. During learning students are in groups, this is intended to help students understand the lesson. This is in accordance with the opinion of Vygotsky (Schunk, 2012) who argues that one's interactions with the environment can help learning and the experiences brought in learning situations can affect learning outcomes. Vygotsky (Slavin, 2008) argues that learning occurs when children are in the zone of their proximal development.

During learning the role of the teacher as a supervisor is only needed when students experience difficulties. The use of guided inquiry-based LKPD does require full ability of students. The ability of students to carry out science process skills is influenced by the amount of interaction in the group and interaction with the teacher. Critical thinking, creativity in learning and accuracy of students also affects the mastery of science process skills. Fitrah (2014) states that science process skills will be explored if students are active in the learning process. Although the development of science process skills of students is still a significant/moderate category, it has shown that students try to follow learning well and are enthusiastic in learning.

Improving the science process skills of students is the result of the development of students' science process skills during learning. Science process skills given at each meeting lead students to better understand and understand science process skills that they must possess and master. Data on the improvement of science process skills in large classes 1 and 2 showed less significance with a mean value of 1.75 (large class 1) and 1.46 (large class 2). From the pre-test data on psychomotor activities, science process skills of students obtained 4 out of 5 basic science process skills in the low category. After going through the learning process and generated post test data psychomotor activities science process skills from the medium to very good categories. From the data obtained it is clear that there is an increase but it is still small, this is because every basic science process skill has a different level of difficulty and indicators and needs to intensify the activities of science process skills in each science subject matter.

From the data improvement and development of science process skills of students during learning using a guided inquiry model provides clarity that the selection of guided inquiry learning models is indeed appropriate in improving the science process skills of students in the classification of living things. This is because science process skills can be integrated in the syntax/phase of guided inquiry, so that students when learning use a guided inquiry model indirectly also learn science process skills (Heriningsih, 2014). This is in line with several studies (Jumarni et al., 2014; Deta et al., 2013; Ambarsari et al., 2013; Bekirog et al., 2014; Fitrah, 2014; and Rahmasiwi, 2015) suggesting the use of guided inquiry learning models can improve science process skills.

3.2 Results of Analysis of the Scientific Attitude of Accuracy

The scientific attitude of accuracy of large class students is presented in Table 3 and Table 4.

Table 3: Recapitulation of Increased Accuracy of Classes 1

Session	Amount/Percentage	Indicators/Statement Point							
		1		2		3		4	
		T	F	T	F	T	F	T	F
1	Total	8	18	8	18	13	13	10	16
	Percentage (%)	31	69	31	69	50	50	38	62
		True = 37,5, False = 62,5							
	Criteria	**Passably**							
2	Total	13	13	12	14	12	14	16	10
	Percentage (%)	50	50	46	54	46	54	62	38
		True = 52, False = 48							
	Criteria	**Good**							
3	Total	17	9	12	14	15	11	18	8
	Percentage (%)	65	35	46	54	58	42	69	31

		True = 59,5, False = 40,5							
	Criteria	**Good**							
4	Total	21	5	17	9	10	16	23	3
	Percentage (%)	81	19	65	35	38	62	88	31
		True = 68, False = 32							
	Criteria	**Good**							

Category: very good (≥75 - 100), good (≥75 - 50), sufficient (≥50 - 25), less (≥25 - 1), less (≤ 1) (Arikunto, 2007).

Table 4: Recapitulation of Increased Accuracy of Classes 2

Session	**Amount/Percentage**	**Indicators/Statement Point**							
		1		2		3		4	
		T	F	T	F	T	F	T	F
1	Total	9	24	11	22	12	21	12	21
	Percentage (%)	27	73	33	67	36	63	36	63
		True = 33, False = 67							
	Criteria	**Passably**							
2	Total	13	20	14	19	12	21	10	23
	Percentage (%)	39	61	42	58	36	64	30	70
		True = 37, False = 63							
	Criteria	**Passably**							
3	Total	18	15	17	16	15	18	19	14
	Percentage (%)	55	45	52	48	45	55	58	42
		True = 53, False = 47							
	Criteria	**Good**							
4	Total	20	13	17	16	20	13	19	14
	Percentage (%)	61	39	52	48	61	39	58	42
		True = 58, False = 42							
	Criteria	**Good**							

Category: very good (≥75 - 100), good (≥75 - 50), sufficient (≥50 - 25), less (≥25 - 1), less (≤ 1) (Arikunto, 2007).

Based on the results of the analysis using the t test which was conducted obtained data that Ha (there is the influence of learning devices as a result of the development of science process skills and students' accuracy) is accepted. Device development results affect the science process skills and accuracy of students, according to researchers because learning devices consisting of syllabus, lesson plans, teaching materials, LKPD and assessment sheets are a unity that is interconnected and supportive. The syllabus which is a guideline for other learning devices plays an important role because the syllabus has seen a link between the components of the device. Learning tools resulting from this development formulate learning models in more detail, help and guide teachers in applying them in the classroom. In other words, the learning device resulting from this development answers the problems faced by the teacher.

The attitude of accuracy of large class 1 and 2 students showed an increase in each meeting. Although the increase in accuracy is not great for both large classes 1 and 2, it has shown positive results. The science process skills carried out are very demanding of accuracy. The ability to observe objects must detail the results of observations. Must be careful in writing the measurement results. Must be thorough and precise in classifying/classifying, must be thorough and precise in making conclusions and communicating data or results of observations. In other words, students begin to understand the meaning of accuracy. Open with an attitude of unhurried work and repeat the work to convince the results of the work. This is in accordance with the results of research by Maimuna (2010) in Natalia (2014) which states that the application of guided inquiry has a positive effect on the scientific attitude of students. The use of guided inquiry learning models in this study clearly seems to help foster an attitude of thoroughness of students. This is reinforced by Jaya, et al. (2014) which states that the guided inquiry learning model is one of the learning models that can shape the character of honesty, discipline, responsibility, thoroughness, cooperation and curiosity.

4. Conclusion and Recommendations

Based on the results of the analysis carried out, conclusions can be drawn as follows:

a. The use of learning devices as a result of development has an effect on improving the science process skills of students.
b. The use of learning devices the results of development affects the accuracy of students.

Based on the results of the research and conclusions that have been stated, the research suggestions can be put forward as follows:

a. Optimal use of learning devices as a result of development by junior high school science teachers can guide and motivate the use of tools and develop devices with other topics.
b. Practicing science process skills should be continuous in every science lesson, even if only one process skill is trained.
c. The habit of training basic science process skills in class VII SMP becomes the basis for practicing continuous science process skills in grades VIII and IX.

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